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SILVICAL LEAFLET 28.

BLACK SPRUCE.

Picea mariana (Mill.) B. S. P.

Black spruce is a very close relative of red spruce, and the two are often distinguished with difficulty. The black spruce, however, is generally a smaller tree and grows chiefly in sphagnum swamps, while the red spruce is found in better-drained situations. The wood has much the same properties as that of red spruce, and is used for lumber and, more especially, for pulp. In Saskatchewan and Manitoba it grows in large, pure stands, which will undoubtedly be largely drawn upon in the future for pulp material.

RANGE AND OCCURRENCE.

Black spruce, like white spruce and tamarack, extends from the coast of Maine, Labrador, and Newfoundland westward to Alaska and the Pacific.

It grows at very high latitudes, almost to the shores of the Arctic Ocean, and extends southward to New England, New York, Michigan, and Wisconsin. In the Appalachian Mountains it is found as far south as Virginia and North Carolina. Some dendrologists, however, have separated the black spruce found in the Appalachians from Pennsylvania to North Carolina into a distinct species, which they name *Picea australis*.

Black spruce is primarily a swamp tree and is a characteristic inhabitant of cold, poorly drained bogs throughout its range. It also grows occasionally on high, well-drained hillsides, but is small and stunted in such situations, and is less abundant than in moister soil.

At its southern limit in the southern Appalachian Mountains it forms dense, pure or mixed stands of small, slender trees in mountain bogs at high elevations. It is an inhabitant of sphagnum swamps in New England, in the Lake States, and in southern Canada, but is not so abundant as in the muskegs of northern Canada, where it often forms pure stands of considerable extent. It reaches its best development in the moist but well-drained alluvial bottomlands of the Athabasca River, and in river valleys in Saskatchewan and northern Manitoba. West of the Yukon it occurs in wet, marshy localities, and is usually to be found growing over buried glaciers. It is not common on the rich

bottomlands along the immediate banks of the Yukon, but is abundant in the Pelly River drainage on swampy portions of the valley bottoms and on moss-covered northerly slopes. At the headwaters of streams on the low, broad divides characteristic of portions of this district it often forms large groves.

CLIMATE.

In the northern part of its range black spruce finds an extremely severe climate, marked by a low degree of atmospheric humidity and small precipitation (in some localities not more than 15 inches), a wide seasonal range of temperature, and occasional strong, drying winds. The annual range of temperature is rarely less than 130 degrees, and the temperature not uncommonly falls to 60° F. below zero in the winter and sometimes rises above 100° F. during the brief summer. The growing season varies from about three weeks in western British Columbia and eastern Alaska to four months on the coast of Bering Sea. Owing to the high latitude the sunlight received during the growing season is less intense but of longer daily duration than farther south. In the winter the insolation is very weak.

ASSOCIATED SPECIES.

In the southern Appalachians black spruce associates sparingly at high altitudes with Fraser fir. It is sometimes found in white cedar (*Chamaecyparis thyoides*) swamps in Pennsylvania and New York, but does poorly in these submerged locations. In the Adirondacks and in New England it forms small dense stands, associated with arborvitæ, tamarack, and balsam fir, and occasionally mixes with white and red spruces, hemlock, balsam fir, and hardwoods about the margins of wet bottomlands. In the Lake States its ordinary associates are tamarack, arborvitæ, and balsam. It is also associated with these trees in southern Canada, and with tamarack almost to its northern limit in British Columbia and Alaska. In Canada it gives way on the better drained localities to white spruce, and on dry ridges to jack pine. In northern Canada and in Alaska it is also found with red alder, black cottonwood, balm of Gilead, aspen, and willows.

HABIT.

Black spruce is a rather small tree; under favorable conditions it attains at maturity a height of from 60 to 80 feet, rarely 100, with a diameter of from 15 to 24 inches, or occasionally 3 feet. The rate of growth may be very slow, on account of suppression or unfavorable conditions, and trees 1 foot in diameter are sometimes found to be 200 years old. When conditions of soil, moisture, and light are favorable, however, black spruce grows rather more rapidly than other spruces. The foliage of the tree is a dark blue-green, which appears almost black at a little distance. The crown is somewhat irregular, with short,

drooping, upturned branches. The difference between trees grown in the open and in dense stands is particularly noticeable in black spruce. In dense stands the bole is tall, straight, clean, and usually of small diameter; in the open the trunk is short, with a rapid taper, and the crown grows low and is irregularly branched. Its root system is shallow. In general appearance it is, perhaps, the least attractive of the eastern spruces.

SOIL AND MOISTURE.

Black spruce makes its best growth in moist alluvial soils with good drainage. It is found most commonly, however, in poorly drained situations with excessive moisture, such as peat bogs and the swampy margins of lakes. Depth of soil is not essential to its development, owing to the shallowness of its root system. It will grow on clay and heavy glacial drift, and though it is sometimes found on sandy hill-sides, it is not well suited to such situations and makes but poor growth there.

TOLERANCE.

Black spruce is very tolerant of shade, and retains the capacity to recover from suppression to an advanced age. In dense stands it produces a heavy crown cover, by means of which it is able to shade out its frequent companion, the intolerant tamarack. It is most tolerant on wet soils, over which it characteristically maintains dense thickets of slow-growing trees, and is least so in relatively dry, well-drained situations, where it grows in more open stands. Black spruce is very retentive of its branches, and tall, clear stems are produced only where the trees grow densely under favorable conditions of soil and moisture.

REPRODUCTION.

Black spruce is not an abundant seed producer, although it usually bears some seed each year. Years of especially abundant seed production are at rather long, irregular intervals. The seeds are winged and are adapted for wide dispersal by the wind. The chief requisite for germination is a sufficient amount of soil moisture, and the seeds will germinate on either mineral or humous soil. In the forest the seeds will germinate in inorganic soil formed by the decay of fallen trees, moss, and spruce leaf litter, but the leaf litter under hardwood stands is not, as a rule, favorable to their germination. The seedlings demand a moderate amount of shade for the first season or two.

MANAGEMENT.

Black spruce, owing to its need of soil moisture, its great tolerance, and its natural growth in stands of uneven age, is adapted to light selection cutting. This holds good whether it be in mixture with other species or in pure stands, and is further emphasized by the fact that it is not windfirm, and that heavy cutting generally results in windthrow.

